Example #13: If a cart of mass 10 kg and with an initial speed of 3.5 m/s rolls down a 50 m high frictionless incline and then proceeds to roll up another similar incline to a height of 20 m, what is the speed of the cart at this point?

At start: $E_T = E_p + E_k$

$= mgh + \frac{1}{2}mv^2$

$= 10(9.8)(50) + \frac{1}{2}(10)(3.5)^2$

$= 4961$ J

At end: $E_T = E_p + E_k$

$4961 = 10(9.8)(20) + \frac{1}{2}(10)v^2$

$v = 25$ m/s